BLAM

What is it?

Where are we?

Where can we go?

BLAM (beam loss analysis M) good there isn't a test.

Accelerator Safety Envelopes from the OPM:

1) Maximum dose potential: (beam intensity * (kinetic energy)$^{.8}$) allowed to be in RHIC is explicitly specified for each ion species.

2) Maximum dose: (beam intensity*(kinetic energy)$^{.8}$) we may lose "at a point" in the RHIC ring is implied.

Dose limit comes from the RSC designation of the majority of the RHIC berm as a Controlled area.

Controlled Area: Under normal operating conditions, a person working in such an area will get an additional dose in a year due to the RHIC operation of less than 100 mR.

C-A D explicit interpretation (in OPM):

1) Beam circulating in RHIC:

Au: < 2.4e11@100GeV/n in each ring

e.g. 120 bunches x 2e9/bunch

P: < 2.4e13@250GeV in each ring

e.g. 120 bunches x 2e11/bunch

Cu: <6.48e11@104GeV/n in each ring

2) Losses:

uncontrolled areas: < 0.5mrem in an hour, < 25mrem in a year

controlled areas: < 5mrem in an hour, < 100mrem in a year.

BLAM's purpose is to allow the Coordinator to respect this "less than 5mrem in an hour" limit.

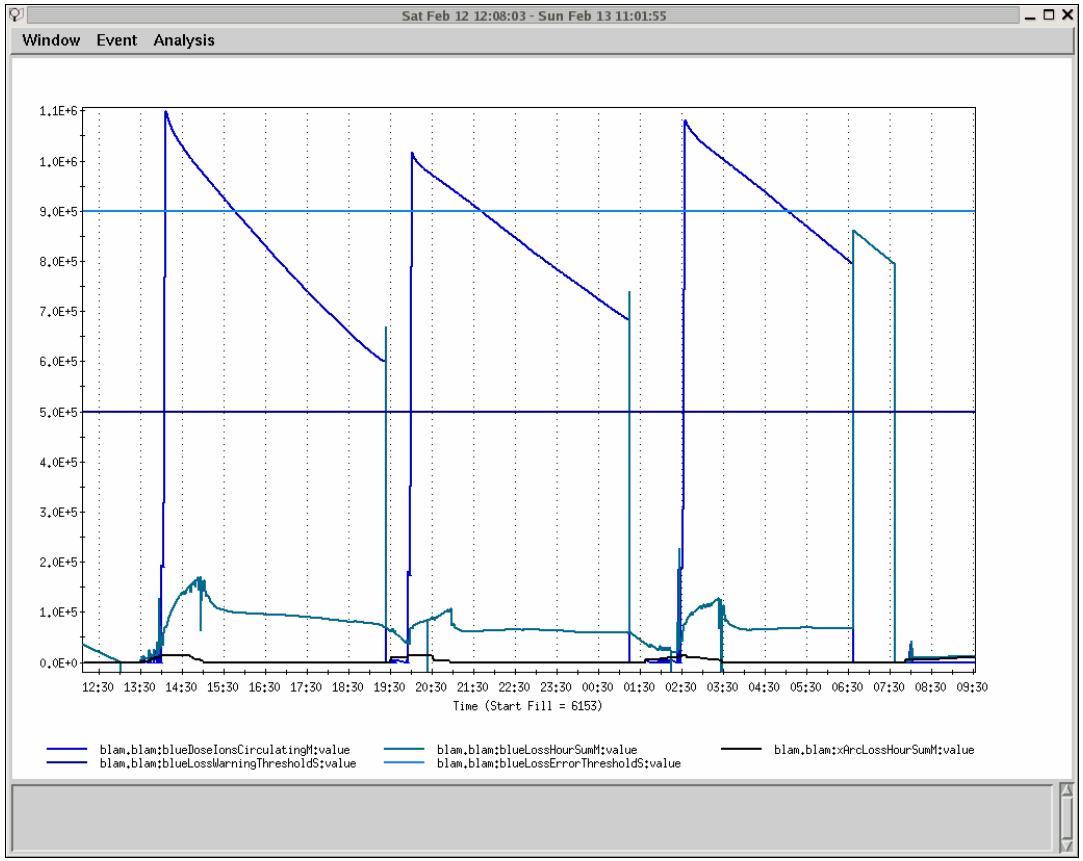
BLAM – a necessary constraining tool

- Provides a well defined machinery to assure that dose on RHIC berm satisfies OPM.
- "Point" beam loss (ions, kinetic energy)<-> RHIC berm dose (mrem) from calculations and Fault Studies.
- This gives max hourly "single point" beam loss allowed.
- Total beam loss and energy well known - from beam current transformer and main dipole setting.
- BLAM Analysis behaves as if all beam losses in the last hour (except "clean" aborts) occur as one hypothetical point in a Controlled Area.
- The one exception - Clean aborts – must have no saturating loss monitors in Controlled Areas.

Blam (continuing)

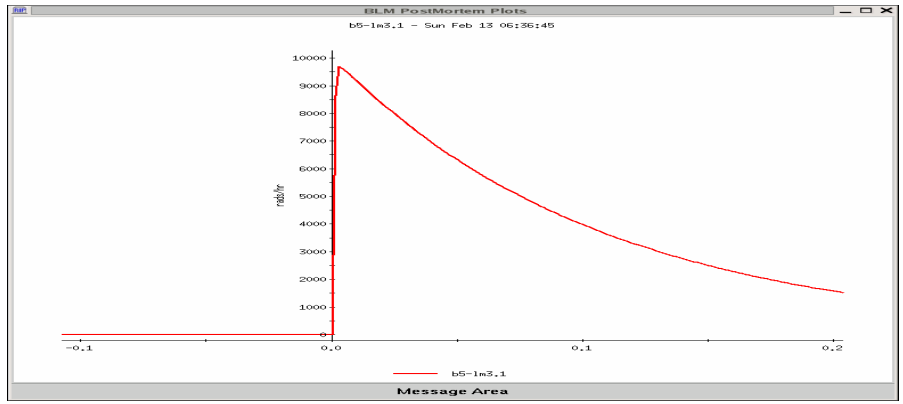
- Gives the Operations Coordinator what is needed to follow OPM “<5mrem in an hour” rule – keeps the operational issue simple.
- If BLAM machinery falters – Operations does too, and that can be problem.
  - Indeed machinery misbehaved early on during the Cu run. “Configuration control” issues among other things. We will do better. Summer work (Laster, Olsen, Nemesure)
- If we push RHIC to BLAM’s simple limits –this too can be a problem, but with a different response.

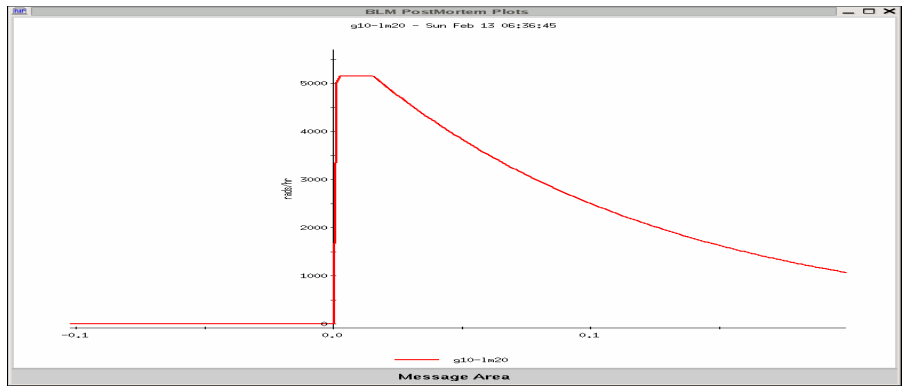
BLAM numbers: Circulating Dose Ions, Hourly Loss, 50% and 90% Loss Limits

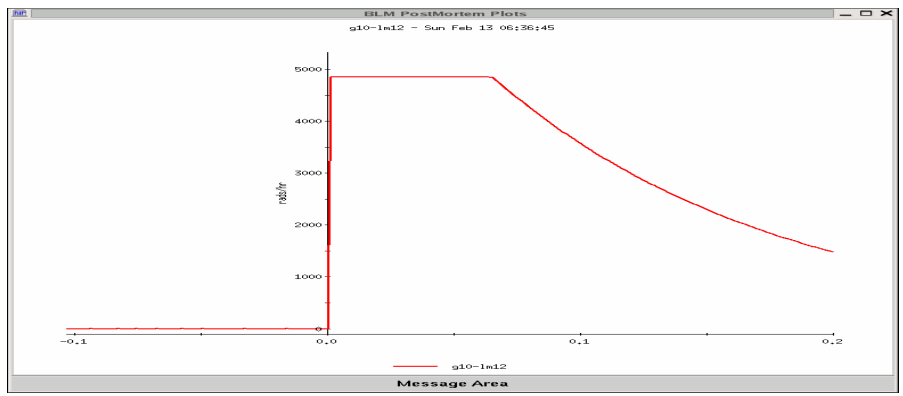


Feb 13 05: Cu running. Note circulating “potential dose” exceeds what is allowed “if all lost at a point in controlled area”. Third store ends with a “dirty” dump.

The saturation problem: responses from three loss monitors to the 13Feb “dirty” dump. This abort was judged dirty because of these saturating monitors. To quantify how much of the beam was dumped into one of these locations requires 1) an estimation of the loss without saturation and 2) a translation of the loss response into ions. Both of these can be rough, but must be defendable – to one whose business is the counting of such things.







BLAM: perhaps unnecessarily over constraining

- Hitting the current limits is getting too easy. Cu intensity put us out of the comfort range.
- Ion loss spatial distribution potentially known from loss monitors – requires a calibration in “ions”.
- The present analysis is simple and conservative. With resources, the analysis (What is a “clean” abort? How much of the beam ended at a particular point?) can be made less restrictive – but then defending becomes more challenging: e.g. prove that no more than x% of the loss occurred in a Controlled area and hence operations can continue immediately.
- Historically true “dirty” dumps rarely allow quick recoveries – the required one hour wait is not a constraint.